U.S. Fish & Wildlife Service

News Release

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Landmark Study Reveals Low National Rate of Frog Abnormalities on Wildlife Refuges

Largest study of its kind advances knowledge of indicator species, identifies regional hotspot clusters

Gray tree frog by USFWS

An unprecedented 10-year-study by the U.S. Fish and Wildlife Service (Service) shows encouraging results for frogs and toads on national wildlife refuges. The study, published today in the peer-reviewed online journal *PLOS ONE*, finds that on average, less than 2 percent of frogs and toads sampled on 152 refuges had physical abnormalities involving the skeleton and eyes – a lower rate than many experts feared based on earlier reports. This indicates that the severe malformations such as missing or extra limbs repeatedly reported in the media during the mid-1990s were actually very rare on national wildlife refuges.

"Frogs and toads are strong indicators of wetland and environmental quality. What affects them affects a broad range of other species," said Service Director Dan Ashe. "This research significantly advances our understanding of amphibian abnormalities while amassing one of the world's largest datasets on the issue."

The study also highlights areas of the country with more abnormal frogs than expected. These areas, termed "hotspot clusters", warrant further research to determine their causes.

Concern about amphibian abnormalities became widespread in 1995 when middle school students discovered frogs with misshapen, extra or missing limbs at a Minnesota wetland. Since then, scientists have continued to report frogs and toads with severe abnormalities and documented global amphibian population declines, disease outbreaks and an increased rate of species extinctions.

In 2000, Congress asked agencies within the Department of the Interior, including the Service and U.S. Geological Survey, to address growing concerns about the health of amphibians in the United States. In response, the Service launched a 10-year study, the largest ever of its kind, to determine the distribution and severity of amphibian abnormalities within the National Wildlife

Refuge System. The research effort – called the National Abnormal Amphibian Program – sampled more than 68,000 frogs on 152 refuges, and in the process, compiled one of the world's largest databases on amphibian abnormalities.

On average, only 2 percent of the frogs and toads were classified as having skeletal or eye abnormalities, the types of abnormalities most commonly studied. The expected background range of zero to 2 percent skeletal/eye abnormalities was found at many refuges. Extra limbs were exceedingly rare: just 0.025 percent of all frogs sampled.

However, consistent with other, prior studies, the Service's study detected areas where sites with higher rates of abnormalities tend to cluster together geographically. Within these regional hotspot clusters, which were found in the Mississippi River Valley (northeast Missouri, Arkansas and northern Louisiana), in the Central Valley of California, and in south-central and eastern Alaska, abnormality frequency often exceeded the national average of 2 percent, affecting up to 40 percent of emerging amphibians in some individual samples.

Analysis of the data showed that the location where the amphibians were collected was a better predictor of whether or not they would be abnormal than was their species or the year they were sampled. There was virtually no evidence that some species were more likely to be abnormal than others or that more abnormal frogs were found in some years than in others.

Although this study was not designed to investigate the reasons behind amphibian abnormalities, the results strongly implicate localized causes. This is consistent with other research, some of which has identified contamination, predators, parasites or the interaction of these as potential factors.

The complete dataset from the study is being made available online at the Dryad Digital Repository (http://doi.org/10.5061/dryad.dc25r) to facilitate future research to aid in the conservation of amphibians and their habitats. To view the journal article, please visit http://dx.plos.org/10.1371/journal.pone.0077467.

For more information on this study, including images for use by media, visit www.fws.gov/contaminants/Issues/Amphibians.cfm.

The Service would like to thank our co-authors from the University of Colorado – Boulder, University of California – Davis, and Indiana University School of Medicine for their outstanding contributions to this study.

The mission of the U.S. Fish and Wildlife Service is working with others to conserve, protect and enhance fish, wildlife, plants and their habitats for the continuing benefit of the American people. We are both a leader and trusted partner in fish and wildlife conservation, known for our scientific excellence, stewardship of lands and natural resources, dedicated professionals and commitment to public service. For more information on our work and the people who make it happen, visit www.fws.gov.

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